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ROOT CANAL FILLING COMPOSITION  
[Konkan jutenzai soseibutsu]

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1. Title of Invention

Root Canal Filling Composition

2. Claim(s)

(1) A root canal filling composition comprising an  $\alpha$ -type tricalcium phosphate and/or tetracalcium phosphate powder, a water-soluble organic acid, a water-soluble polyhydric alcohol, and an X-ray contrast medium.

(2) The root canal filling composition of Claim 1, wherein the aforesaid water-soluble organic acid is at least one kind of organic acid chosen from a group comprising a homopolymer of citric acid, malonic acid, malic acid, maleic acid or acrylic acid, and an acrylic acid and itaconic acid copolymer.

(3) The root canal filling composition of Claim 1, wherein the aforesaid water-soluble polyhydric alcohol is at least one kind of polyhydric alcohol chosen from a group comprising glycerin, ethylene glycol and propylene glycol.

(4) The root canal filling composition of Claim 1, wherein the aforesaid X-ray contrast medium is barium sulfate and/or bismuth subcarbonate.

3. Detailed Specifications

The present invention relates to a curable root canal filling

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\*Numbers in the margin indicate pagination in the foreign text.

composition used as a root canal filling in the field of dental treatments.

A root canal filling operation in the field of dental treatments is a treatment in which the root canal cavity is occluded with a root canal filling composition after a pulpectomy or after treating an infected root canal for planning protection and recovery from a root apex wound and for the purpose of preserving a tooth after an operation.

In the past, such a treatment included a noncurable paste root canal filler (e.g., formalin-based) or a curable paste root canal filler (e.g., zinc oxide-eugenol-based) for the purpose of promoting treatment on a root apex, or a solid root canal filler (e.g., gutta-percha point). Although treatment of tissue can be expected with a /2 noncurable paste root canal filler from among these treatments, it is unstable in long-term applications because it does not cure in a root canal. A solid root canal filler only physically occludes the root canal and treatment of a tissue cannot be anticipated.

Vis-à-vis, achieving both the purpose of treating tissue and closing a root canal can be anticipated with a noncurable paste root canal filler which cures inside a root canal after kneading or after a fixed amount of time has elapsed. When a solid root canal filler is also used as a sealer, a solid root canal filler, such as a gutta-percha point, is fixed to the root canal wall, and eliminating the existence of a dead space can be anticipated.

This curable paste root canal filler was composed mainly of zinc oxide in the past, and a ZnO-eugenol cement utilized by mixing zinc oxide with eugenol was often used. However, the constituents of this cement are completely foreign to the constituents of teeth, and it is not always a satisfactory material from the standpoint of tissue compatibility.

To solve this problem, recently, a curable paste root canal filler used by adding hydroxyapatite resembling the main constituents of bone and teeth to a powder, and mixing this and guaiacol, or the like, has been proposed (e.g., Tokukai JP-A No. S62-255403).

However, in these known arts, there are problems because the collapse rate of the cured product is high and the performance demanded of a root canal filler is not satisfactory.

The present invention relates to a single-paste-type root canal-filling composition composed of a powder agent composed mainly of calcium phosphate having a composition resembling the main constituents of bone and teeth, similar to hydroxyapatite, a water-soluble organic acid, a water-soluble polyhydric alcohol, and an X-ray contrast medium, and cured in the root canal. The single-paste curable in the root canal of the present invention is a root canal-filling composition, which fills in the root canal without curing it, subsequently reacted with the interstitial bodily fluids or intramedullary fluids from the root apex and the dentinal tubules, and cured. It is outstanding in tissue compatibility, the collapse rate of

the cured product is low, and it has high performance as a root canal filler.

That is, the present invention relates to a single-liquid-type curable paste root canal-filling composition composed mainly of  $\alpha$ -tricalcium phosphate and/or tetracalcium phosphate, outstanding in tissue compatibility, composed of a homopolymer of citric acid, malonic acid, malic acid, maleic acid and acrylic acid, and an acrylic acid and itaconic acid copolymer, which are biologically derived water-soluble organic acids, a polyhydric alcohol, such as glycerin, ethylene glycol or propylene glycol, as the wetting agent, and barium sulfate or bismuth subcarbonate, as the X-ray contrast medium.

The single-liquid-type curable paste root canal filler of the present invention preferably uses, with respect to the total amount of paste, 30 to 50% by weight of  $\alpha$ -tricalcium phosphate and/or tetracalcium phosphate, 6 to 15% by weight of the organic acid, 20 to 30% by weight of the polyhydric alcohol, and 15 to 25% by weight of the X-ray contrast medium.

The present invention will now be described in further detail according to practical examples.

(単位%)

		1	2	3	4	5	6	7		
ベ イ ス ト 界	α-リン酸三カルシウム	43.0	29.9			39.0		25.0		
	リン酸四カルシウム		30.0	47.0	45.0		50.0	22.0		
	リンゴ酸			9.0			0.9	9.0		
	タエリ酸	8.0			4.0		2.0			
	マレイン酸				5.0					
	マロン酸		10.0							
	アクリル酸					15.0				
	グリセリン	29.0		24.0	27.0	39.0				
	エチレングリコール		10.0					24.0		
	プロピレングリコール		10.0				20.0			
ISO 規格	水酸化ビスマス	23.0	23.0	20.0		25.0	20.0			
	硫酸バリウム				10.0			20.0		
	フローレート (20以上)	25.0	28.5	31.0	25.5	24.0	29.5	25.0		
ISO 規格	硬化時間 (72時間以内)	3.0	6.5	4.0	2.0	3.5	3.5	3.8		
	収縮率 (1%以内)	2.4	1.2	1.8	3.0	2.4	2.7	2.2		

(% by weight)

Paste Agent	α-Tricalcium phosphate												
	Tetracalcium phosphate												
	Malic acid												
	Citric acid												
	Maleic acid												
	Malonic acid												
	Acrylic acid												
	Glycerin												
	Ethylene glycol												
	Propylene glycol												
	Bismuth subcarbonate												
	Barium sulfate												
ISO Standard	Flow rate (≥20)												
	Curing time (≤72 hours)												
	Collapse rate (≤3%)												

The other constituents were compounded with the tricalcium  $\alpha$  - type phosphate and/or tetracalcium phosphate powder confirmed by an X-ray diffraction method, at the proportions shown in Table 1, to obtain a paste. A syringe was charged, stored for 30 days, the composition was subsequently discharged from the syringe, and the flow rate, curing time and collapse rate were measured in accordance with ISO 6876. The results are shown in Table 1.

All of the root canal-filling compositions of the present invention are root canal-filling compositions compatible with the ISO standard, outstanding in dental physiotechnical properties, and can contribute to dental treatments.